Limnological Results from the 1985 British Columbia Lake Enrichment Program

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by

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ABSTRACT

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Results of the 1985 Limnology subprogram of the British Columbia Lake Enrichment Program (LEP) are presented. Twenty-five stations in 19 lakes were sampled for a variety of physical, chemical, and biological variables. The number of times each lake was sampled ranged from one to 19. Summarized data for each station and date are presented, and raw data are contained in the Appendix tables.

Key words: lake fertilization, humic-stained, glacially turbid, warm monomictic, oligotrophic, nutrients, bacteria, picoplankton, phytoplankton, zooplankton

RESUME

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Les auteurs présentent les résultats obtenus en 1985 dans le cadre du sous-programme de limnologie du Programme d'enrichissement de lacs (PEL) de la Colombie-Britannique. Diverses variables physiques, chimiques et biologiques ont été requeillion à 25 stations de 19 lacs, dont chaque a été échantillonné d'une à dix-neuf fois. Les données sont résumées en fonction de chaque station et de la date et les données brutes sont présentées en annexe.

Mots-clés: fertilisation lacustre, lac coloré d'acide humique, lac glaciaire turbido, lac monomictique chaud, lac oligotrophe bioéléments, bactéries, picoplancton, phytoplancton, zooplancton

INTRODUCTION

The Lake Enrichment Program, under the auspices of the Federal-Provincial Salmonid Enhancement Program (SEP), commenced in 1977 with the fertilization and study of six lakes. In 1985, 15 lakes were fertilized and limnological surveys were conducted on a total of 19 lakes. It has been demonstrated (Hyatt and Stockner 1985; Stockner and Shortreed 1985) that controlled additions of inorganic nitrogen and phosphorus fertilizers increase phytoplankton and zooplankton production, and that juvenile sockeye respond to these increases with increased growth and/or survival. Data obtained from earlier work on many of these lakes and the rationale and objectives of these continuing studies have been previously reported by Stockner (1979), Stockner and Shortreed (1978; 1979; 1985), Stockner et al. (1980), Shortreed and Stockner (1981), MacIsaac et al. (1981), Costella et al. (1982; 1983a; 1983b), Nidle et al. (1984) and Nidle and Shortreed (1985). After further analysis, data presented in this report will be used to determine the effect of fertilizer additions on treated lakes, and to calculate appropriate fertilizer loads in untreated lakes which are candidates for fertilization.

DESCRIPTION OF STUDY LAKES

The 19 lakes sampled during 1985 represented a wide variety of morphometric and hydrologic types (Table 1, Figure 1). All study lakes are oligotrophic and most are warm monomictic, however Kitlope, Morice and Tahltan lakes are dimictic and Henderson Lake is meromictic. Of the 19 lakes studied, 9 were humic stained, 8 were clear, and 2 had varying degrees of glacial turbidity. As a result, average Secchi depths ranged from 5.0 to 17.0 m. The lakes have relatively small littoral zones, low inorganic nutrient levels, low phytoplankton biomass (Shortreed and Stockner 1981), low bacterioplankton biomass (MacIsaac et al. 1981) and low zooplankton biomass (Rankin and Ashton 1980; Rankin et al. 1979). Maps showing station locations for Devon, Morice, Muchalat, Skidegate and Tahltan lakes are presented in Figures 2-6. Station locations for all other lakes are presented in Nidle et al. (1984) and Nidle and Shortreed (1985).

METHODS

Lakes in this study were fertilized once a week for 18 weeks during the growing season. The fertilizer was an aqueous solution of ammonium nitrate and ammonium phosphate in an N:P atomic ratio of 15:1, with the following exceptions: fertilizer applied to the main arm of Kennedy Lake (station 2) and Henderson Lake had an N:P atomic ratio of 35:1, Nimpkish Lake fertilizer had an N:P atomic ratio of 1:1, Sproat Lake fertilizer had a 50:1 N:P atomic ratio and Tahltan Lake fertilizer had an N:P ratio of 25:1. Fertilizer was applied using a DC-6 water bomber and fertilizer application techniques are described in Stephens and Stockner (1983). Fertilizer loads to lakes in 1985 are presented in Table 1. Float-equipped de Havilland Beaver aircraft were used to sample all lakes except Sproat, which was sampled by boat. The

number of sampling dates for each lake, the depths sampled, and the types of analyses carried out at each station varied considerably, and are listed in Table 3.

Temperature profiles from the surface to the lake bottom (or a maximum depth of 200 m) were obtained at most stations using an Applied Microsystems conductivity, temperature and depth measuring system (Model CTD-12) or an Applied Microsystems salinity, temperature and depth measuring system (Model STD-12). Buoyancy frequencies (s^{-1}) were calculated (Turner 1973) and the depth of maximum buoyancy frequency was used to determine epilimnion depth. Water temperature and an equation of state (Chen and Millero 1977) were used to quantify convective stability (Johnson and Merritt 1979).

A Li-Cor light meter (Model 185A) equipped with a Li-Cor underwater quantum sensor (Model Li-192S) was used to measure photosynthetically active radiation (PAR: 400-700 nm) from the surface to the compensation depth (1% of surface intensity) and vertical light extinction coefficients were calculated. A standard 22-cm white Secchi disk was used to measure water transparency.

An opaque 6-L Van Dorn bottle, rinsed with 95% ethanol, was used to collect all water samples, which were usually collected between 0800 and 1200 h. An acid washed, deionized distilled water (DDW) rinsed, screw-capped test tube was rinsed and then filled with sample water from each sampling depth, covered with clean aluminum foil, capped, stored at 4 °C, and later analyzed for total phosphorus. All chemical analyses were carried out according to those methods given in Stephens and Brandstaetter (1983). Water samples for the remaining nutrient analyses and for chlorophyll determinations were collected in 1-L or 2-L polyethylene bottles, kept cool and dark, and filtered within 2-4 h. Water for dissolved nutrient analyses was filtered through 47-mm Whatman GF/F filters, which had been previously ashed (460 °C for 4 h) and washed (500 mL DDW). Each filter was placed in a 47-mm Swinnex (Millipore Corp.) filtering unit, rinsed with an additional 500 mL of DDW, and then rinsed with approximately 50 mL of sample. An acid washed, DDW rinsed glass bottle was rinsed and filled with 100 mL of filtered water, covered with clean aluminum foil, capped, and stored at 4 °C in the dark, and later analyzed for nitrate, ammonia and total dissolved nitrogen. An additional 100 mL of sample was filtered into a precleaned and rinsed polyethylene bottle, stored at 4 °C in the dark, and later analyzed for soluble reactive silicon and total dissolved solids.

One liter of water from each sampling depth was filtered through an ashed and washed 47-mm diameter Whatman GF/F filter, which was then folded in half, placed in an ashed aluminum dish, stored in a dessicator overnight, and then frozen prior to being analyzed for particulate carbon and nitrogen. A 2-L sample was filtered through an ashed and washed 47-mm diameter Whatman GF/F filter which was then placed into a clean scintillation vial, and later analyzed for particulate phosphorus. A 500-mL sample was filtered under subdued light through a 47-mm diameter 0.8-µm Millipore AA filter and a few drops of $MgCO_3$ suspension were added. The filter was folded in half, placed in an aluminum dish, stored overnight in a dessicator, and then frozen until it was analyzed for total chlorophyll using a Turner fluorometer (Model 112).

At stations where primary productivity was measured, glass jars were filled completely with water (generally from 1, 3 and 7.5 m), and sealed. A Cole-Parmer Digi-Sense pH meter (Model 5986-10) was used to determine the pH and total alkalinity of these samples according to the standard potentiometric method of APHA (1980). Dissolved inorganic carbon (DIC) was established indirectly from pH, temperature, total dissolved solids and bicarbonate alkalinity.

Test tubes containing 2-3 mL of 95% ethanol were rinsed thoroughly with water, and then filled. From each test tube 5 mL were filtered through a 25-mm diameter, 0.2-µm Nuclepore membrane filter counter-stained with Irgalan black. Filters were removed when just dry, placed in petri dishes lined with absorbent filter paper, and air-dried at room temperature. Bacterioplankton numbers were later determined from these samples using the acridine orange direct count method as described by MacIsaac et al. (1981). Random fields were counted on each filter until 300 bacteria or 10 fields were enumerated, and the counts converted to numbers/mL. Occasional blanks were used to check for significant bacteria background counts in the Irgalan black solution and rinse water.

Opaque 125-mL polyethylene bottles were rinsed and filled with sample water in the field for phytoplankton enumeration and identification. Phototrophic picoplankton (cyanobacteria and eukaryotic algae <3 µm in diameter) were enumerated using a method developed by MacIsaac and Stockner (in prep.) as described briefly by MacIsaac and Stockner (1985). Fifteen mL of sample water was filtered through stained Nuclepore filters as described for the bacteria samples. Care was taken to minimize exposure of the sample to light during sampling and laboratory processing. Filters were placed in opaque petri dishes, air-dried, and stored in the dark at room temperature for 1 to 4 weeks. During analysis, each filter was placed on a wetted 40-µm mesh nylon screen in a filter holder, 1-2 mL of filtered DDW were added to the filter column, and the cells on the filter were rehydrated for 3 to 5 min. The water was drawn through at a vacuum pressure of 20 cm Hg, and the moist filter was placed on a glass slide with a drop of immersion oil and a coverslip. The Zeiss epifluorescence microscope was equipped with a 397 nm longwave-pass exciter filter and a 560 nm shortwave-pass exciter filter, a 580 nm beam-splitter mirror and a 590 nm longwave-pass barrier filter. Filters were examined at 1250 X magnification under oil immersion, and random fields were counted to a minimum of 200 cells or 30 fields per sample. Phototrophic picoplankton were identified as cyanobacteria or eukaryotic algae, assigned to general categories based on morphological characteristics and fluorescence colour, and scored into size categories.

The remaining sample water in the opaque polyethylene bottles was fixed with 1 mL of Lugol's solution and phytoplankton >3 µm in diameter were later enumerated and indentified from this sample. For analysis, each sample was gently mixed and a subsample settled overnight in a settling chamber of 7-, 12- or 27-mL volume. One transect at 187.5 X and one at 750 X magnification were counted using a Wild M40 inverted microscope equipped with phase contrast optics. Cells were identified to genus or species and assigned to one or more size classes. Counts were converted to numbers and cell volumes and carbon biomass was calculated using formulas modified from Strathmann (1967).

Primary production was measured at both stations at Sproat Lake at 7 to 10 depths in the water column (usually between 0 and 30 m). Two 125-mL light bottles were filled with water from each depth and dark bottles were filled with water from 1, 3, 5 and 30 m. Each bottle was inoculated with approximately 93 kBq of a ^{14}C-bicarbonate stock solution. At each station activity of the stock solution was determined by inoculating three scintillation vials containing 0.5 mL of Scintigest (Fisher Scientific). Bottles were incubated at their respective depths for 1-2 h, generally between 0900 and 1200 h. After incubation, bottles were placed in dark boxes and transported to the field laboratory where filtration started within 2 h after incubation stopped. Two 50-mL aliquots were removed from each bottle and filtered through 47-mm diameter Nuclepore filters (0.2 and 8.0 µm pore size) at a vacuum not exceeding 20 cm Hg. Filters were placed into scintillation vials containing 0.5 mL of Scintigest. All vials were stored cold in the dark. At the laboratory, 10 mL of Scintiverse II (Fisher Scientific) were added to each scintillation vial. Samples were counted in a Packard Tri-Carb 4530 Liquid Scintillation counter. Quench series composed of the same scintillation cocktail and filters as used for samples were used to determine counting efficiency and Strickland's (1960) equation was used to calculate primary production rates. Production was converted from hourly to daily rates using light data collected with Li-Cor printing integrators (Model 550) equipped with Model 190S quantum sensors.

Zooplankton were sampled by vertical hauls with a 100-µm mesh size SCOR (Scientific Committee on Ocean Research) net (0.25 m^2 mouth area) towed at approximately 0.5 m/s from 50 m to the surface. Zooplankton were preserved in a 4% formalin-sucrose solution buffered with borax (Haney and Hall 1973). Filtration efficiency of the net was assumed to be 100%. At the laboratory, each sample was halved using a Folsom plankton splitter. One half was filtered onto an ashed and weighed Whatman GF/C filter, dried to a constant weight at 90 °C for 24 h and weighed. This portion of the sample was then ashed (460 °C for 4 h) and weighed again. Zooplankton biomass is expressed as mg dry weight/m^3 and mg ash-free dry weight/m^3. The other portion of the sample was used for zooplankton identification and enumeration, which will be reported elsewhere.

RESULTS

Summary tables consisting of monthly means and time weighted growing season averages, along with raw data tables for each lake, station and date are presented. Temperature and conductivity data from CTD and STD measurements, along with in vivo fluorescence data were collected during the study but are not reported here

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Table 1. Geographic and hydrologic data from, and fertilizer additions to, the 1985 study lakes.

Lake	Latitude (N)	Longitude (W)	Elevation (m)	Lake area (km^2)	Mean Depth (m)	Water residence time (y)	Fertilizer load (mg $P \cdot m^{-2} \cdot wk^{-1}$)	N:P ratio (by atoms)
Awun	53°36'	132°35'	16	4.9	47	0.9	4.00	15
Bonilla	53°31'	130°15'	10	2.3	34	1.0	5.00	15
Curtis	53°30'	129°50'	10	3.0	34	0.6	5.00	15
Devon	53°27'	129°45'	10	1.8	29	1.3	5.00	15
Eden	53°51'	132°43'	52	5.9	43	0.9	4.00	15
Great Central	49°22'	125°15'	82	51.0	212	7.3	3.00	15
Henderson	49°05'	125°02'	15	15.0	109 (43)[a]	3.2 (1.3)[a]	3.00	35
Hobiton	48°45'	124°49'	15	3.6	36	1.0	0	
Ian	53°45'	132°35'	35	20.0	50	1.1	0	
Kennedy-1	49°08'	125°35'	4	17.0	51	1.7	0	
Kennedy-2	49°04'	125°30'	4	47.0	27	0.9	3.00	35
Kitlope	53°07'	127°13'	15	12.0	86	0.4	4.00	15
Long	51°14'	127°10'	15	21.0	73	1.1	3.00	15
Morice	54°00'	127°40'	797	96.1	100	3.8	5.00	15
Muchalat	49°50'	126°15'		5.2			0	

Table 1. (continued)

Lake	Latitude (N)	Longitude (W)	Elevation (m)	Lake area (km^2)	Mean depth (m)	Water residence time (y)	Fertilizer load (mg $P \cdot m^{-2} \cdot wk^{-1}$)	N:P ratio (by atoms)
Nimpkish	50°25'	126°57'	20	37.0	162	1.4	3.00	1
Skidegate	53°00'	131°55'		6.9			0	
Sproat	49°14'	125°06'	29	41.0	59	8.0	3.00	50
Tahltan	58°00'	131°43'		5.9			3.75	25
Yakoun	53°19'	132°17'	107	8.1	39	2.5	4.00	15

[a]numbers in brackets are the result of calculating the lake volume using only the mixolimnion.

Table 2. Legend for Table 3.

Symbol	Variables measured
A	physical variables (Secchi depth, 0-50 m temperature profile, light profile to compensation depth)
B	CTD or STD profile
C	ammonia, total dissolved nitrogen, nitrate, total phosphorus, soluble reactive silicon, total dissolved solids
D	C (above) plus particulate carbon, nitrogen and phosphorus
E	total chlorophyll
F	picoplankton and phytoplankton identification and enumeration
G	bacteria biomass
H	zooplankton biomass (vertical haul 0-50 m) and zooplankton ash-free dry weight
I	pH, total alkalinity and dissolved inorganic carbon
J	primary production
K	fluorometer profile

Table 3. Physical, chemical and biological variables measured at each lake and station during 1985.

Lake and station	Variables measured	Depths sampled (m)	Number of sampling dates
Awun	C,E	1,3,5	2
Bonilla	C,E	1,3,5	2
Curtis	C,E	1,3,5	2
Devon	C,E	1,3,5	1
Eden	C,E	1,3,5	2
Great Central-1	A,C,D,E,F,G	1,3,5,23,40	1
Great Central-2	A,B,C,D,E,F,G,H	1,3,5,23,40	9
Henderson	A,B,C,D,E,F,G,H	1,3,5,30	3
Hobiton	A,B,C,D,E,F,G,H	1,3,5,30	9
Ian	C,E	1,3,5	1
Kennedy-1	A,B,C,D,E,F,G,H	1,3,5,30	9
Kennedy-2	A,B,C,D,E,F,G,H	1,3,5,30	9
Kitlope	C,E	1,3,5	2
Long-1	C,E	1,3,5	1
Long-2	C,E	1,3,5	1
Morice-1	C,E	1,3,5	2
Morice-2	C,E	1,3,5	2
Muchalat	A,C,D,E,F,G,H	1,3,5,30	1
Nimpkish-1	A,B,C,D,E,F,G,H	1,3,5,30	7
Nimpkish-2	A,B,C,D,E,F,G,H	1,3,5,30	7
Skidegate	C,D,E,H	1,3,5	1
Sproat-1	A,B,C,D,E,F,G,H,I,J,K	variable	20
Sproat-2	A,B,C,D,E,F,G,H,I,J,K	variable	20
Tahltan	A,B,C,D,E,F,G,H	variable	4
Yakoun	C,E	1,3,5	2

Table 4. Monthly sampling dates for the 1985 study lakes.

LAKE	GCL-2	Hobiton	Kennedy-1	Kennedy-2	Nimpkish-1	Nimpkish-2	Sproat-1	Sproat-2
Jan							15	16
Feb							12	13
Mar	12	12	12	12				
Apr	10	10	10	10	23	23	11	12
Apr							24	25
May	14	14	14	14	28	28	13	12
May							29	30
Jun	11	11	11	11	25	25	12	13
Jun							26	27
Jul	9	9	9	9	23	23	10	11
Jul							24	25
Aug	7	7	7	7	19	19	8	9
Aug							21	22
Sep							4	6
Sep	5	5	5	5	17	17	18	19
Oct	1	1	1	1			2	3
Oct					16	16	17	18
Oct	29	29	29	29			30	31
Nov							13	14
Dec							17	18

Table 5. Variation in surface temperature (°C) during 1985.

LAKE	GCL-2	Hobiton	Kennedy-1	Kennedy-2	Nimpkish-1	Nimpkish-2	Sproat-1	Sproat-2
Jan							5.0	5.0
Feb							4.6	4.8
Mar	5.9	5.3	6.4	5.7			5.1	5.8
Apr	8.7	8.6	9.4	8.0	6.2	6.3	7.4	9.1
Apr							6.8	9.3
May	10.4	9.8	10.3	10.4	9.8	9.7	8.4	10.2
May							14.5	14.0
Jun	16.6	16.3	15.8	14.9	13.5	12.8	15.1	16.4
Jun							17.5	18.6
Jul	22.0	21.3	20.4	20.1	18.2	17.0	19.8	20.5
Jul							23.4	22.8
Aug	21.4	20.9	20.6	20.4	16.8	16.3	21.1	20.8
Aug							20.8	21.1
Sep	19.9	19.1	19.3	18.9	15.6	15.3	20.2	19.5
Sep							17.8	17.9
Oct	17.0	16.0	16.4	16.8			17.1	17.3
Oct					12.9	13.3	15.0	14.9
Oct	11.5	10.8	10.3	10.7			11.8	12.2
Nov							9.5	9.8
Dec							5.6	5.7
$\bar{X}$	16.3	15.9	15.7	15.8	14.4	13.9	17.4	16.2

Table 6. Variation in mean epilimnetic temperature (°C) during 1985.

LAKE	GCL-2	Hobiton	Kennedy-1	Kennedy-2	Nimpkish-1	Nimpkish-2	Sproat-1	Sproat-2
Jan							5.0	5.2
Feb							4.6	4.8
Mar	4.4	5.3	6.1	5.3			5.1	5.5
Apr	8.2	8.1	9.0	7.9	6.2	6.3	7.2	8.1
Apr							6.4	8.4
May	8.7	9.0	9.2	9.7		9.3	8.2	9.3
May							12.8	13.6
Jun	13.8	15.2	14.1	14.5	13.5	12.6	14.7	15.1
Jun							17.4	18.4
Jul							22.6	22.0
Aug	21.3	20.8	20.6	20.2			20.6	20.7
Sep	19.8	19.0	19.2	18.8			20.0	19.5
Oct	11.6	10.8	10.3	10.6	12.8	13.1	14.9	14.9
Oct							11.9	12.2
Nov							9.6	9.8
Dec							5.5	5.7
$\bar{X}$	14.8	14.9	14.6	14.9	12.5	12.0	17.0	15.6

Table 7. Variation in depth of maximum stability (m) during 1985. (U denotes an unstable water column)

LAKE	GCL-2	Hobiton	Kennedy-1	Kennedy-2	Nimpkish-1	Nimpkish-2	Sproat-1	Sproat-2
Jan							U	U
Feb							U	U
Mar	U	U	U	U			U	U
Apr	4.1	5.9	5.8	6.4	U	U	8.0	10.0
Apr							7.7	16.6
May	22.7	14.2	12.1	11.2	U	U	12.5	15.5
May							9.7	7.2
Jun	13.4	7.2	6.1	8.2	22.7	15.7	8.5	11.2
Jun							6.7	10.6
Jul							8.3	10.8
Aug	10.8	3.1	8.2	9.3			11.8	12.2
Sep	10.7	9.4	10.0	11.4			13.3	13.2
Oct	17.0	15.6	9.9	17.2	30.6	27.9	13.3	14.4
Oct							15.6	13.0
Nov							21.5	17.4
Dec							U	U

Table 8. Variation in modified Schmidt stability index ($kg \cdot s^{-2}$) during 1985.

LAKE	GCL-2	Hobiton	Kennedy-1	Kennedy-2	Nimpkish-1	Nimpkish-2	Sproat-1	Sproat-2
Jan							40	15
Mar	28	40	70	61				233
Apr	546	851	879	486	1126	512	2188	873
Apr							606	864
May	833	803	1167	895		535	442	1237
May							3129	3009
Jun	7683	8400	7749	6312	9348	7775	6729	9190
Jun							13179	10415
Jul							40902	29666
Aug	19376	11847	18359	14480			92678	28998
Sep	21263	15524	16430	5407			69661	5378
Oct	4655	2587	2615	1405	9443	10223	28742	8194
Oct							14072	3796
Nov							9641	563
Dec							867	94
$\bar{X}$	10580	7957	9196	5987	8521	7226	37522	10001

Table 9. Variation in Secchi depth (m) during 1985.

LAKE	GCL-2	Hobiton	Kennedy-1	Kennedy-2	Nimpkish-1	Nimpkish-2	Sproat-1	Sproat-2
Jan							15.0	13.5
Feb							16.5	17.0
Mar	12.2	7.8	8.2	6.0			17.0	14.0
Apr	10.0	6.5	5.5	6.0	8.0	8.5	12.0	11.0
Apr							12.5	10.5
May	12.0	5.0	8.5	7.0		8.0	12.0	
May							10.0	9.5
Jun	9.0	6.4	6.5	5.0	7.0	8.0	8.0	13.5
Jun							10.0	13.5
Jul	10.5	8.5	10.0	6.0	7.0	6.0	9.5	14.0
Jul							12.5	15.0
Aug	10.0	7.5	10.5	6.0	6.5	8.0	10.0	16.5
Aug							13.5	15.5
Sep	13.5	8.5	9.5	6.0	7.0	9.0	11.5	14.5
Sep							10.0	14.0
Oct	11.5	9.5	10.0	8.5	8.5	10.5	11.0	15.0
Oct							12.5	14.0
Oct	9.0	6.0	5.5	5.5			10.0	14.0
Nov							11.5	14.5
Dec							13.2	14.0
$\bar{X}$	10.8	7.3	8.5	6.3	7.2	8.1	11.1	13.2

Table 10. Variation in compensation depth (m) during 1985.

LAKE	GCL-2	Hobiton	Kennedy-1	Kennedy-2	Nimpkish-1	Nimpkish-2	Sproat-1	Sproat-2
Jan							16.6	18.9
Feb							20.0	21.1
Mar	16.3	7.1	8.4	7.5			16.7	16.2
Apr	19.3	9.1	10.8	9.2	11.0	10.1	20.0	14.1
Apr							18.9	19.2
May	15.8	7.6	9.8	8.2		10.9	16.9	15.6
May							20.6	23.0
Jun	16.6	9.3	10.5	11.0	10.9	10.5	19.2	21.9
Jun							18.8	22.6
Jul	17.3	8.7	12.7	9.2	11.0	10.8	20.6	23.4
Jul							21.8	19.0
Aug	18.1	8.3	11.9	10.2	10.3	10.7	22.3	25.6
Aug							21.1	21.4
Sep	16.5	10.2	13.6	11.2	14.6	11.8	22.9	24.4
Sep							16.3	25.6
Oct	19.8	9.9	10.6	11.9			22.8	21.1
Oct					11.3	12.9	21.4	26.2
Oct	16.2	6.2	7.4	7.8			15.0	21.6
Nov							13.4	26.2
Dec							19.4	20.2
$\bar{X}$	17.5	8.8	11.2	10.0	11.5	11.1	20.2	21.4

Table 11. Variation in mean extinction coefficient (k_e) during 1985.

LAKE	GCL-2	Hobiton	Kennedy-1	Kennedy-2	Nimpkish-1	Nimpkish-2	Sproat-1	Sproat-2
Jan							0.26	0.22
Feb							0.22	0.20
Mar	0.27	0.59	0.50	0.58			0.26	0.26
Apr	0.22	0.47	0.39	0.44	0.38	0.44	0.21	0.33
Apr							0.23	0.23
May	0.26	0.52	0.41	0.52		0.39	0.26	0.29
May							0.21	0.19
Jun	0.26	0.45	0.40	0.41	0.38	0.40	0.23	0.20
Jun							0.23	0.19
Jul	0.26	0.51	0.34	0.49	0.37	0.40	0.22	0.19
Jul							0.21	0.22
Aug	0.23	0.53	0.37	0.42	0.42	0.40	0.19	0.17
Aug							0.21	0.19
Sep	0.23	0.42	0.32	0.39	0.28	0.39	0.19	0.18
Sep							0.23	0.17
Oct	0.22	0.44	0.42	0.35			0.20	0.19
Oct					0.36	0.32	0.20	0.16
Oct	0.26	0.63	0.58	0.56			0.29	0.20
Nov							0.31	0.16
Dec							0.22	0.21
$\bar{X}$	0.24	0.48	0.39	0.44	0.36	0.39	0.22	0.21

Table 12. Variation in mean epilimnetic pH, total alkalinity ($mg \cdot L^{-1}$ $CaCO_3$) and DIC ($mg \cdot L^{-1}$) during 1985.

	pH		Total alkalinity		DIC	
LAKE	Sproat-1	Sproat-2	Sproat-1	Sproat-2	Sproat-1	Sproat-2
Jan	7.2	7.1	22.28	24.32	6.59	7.34
Feb	7.1	7.0	22.07	24.01	6.70	7.47
Mar	7.0	7.2	21.90	23.74	6.81	6.97
Apr	7.2	7.0	23.36	24.68	6.72	7.63
Apr	7.3	7.2	22.96	24.76	6.38	7.02
May	6.9	7.2	22.98	25.12	7.66	7.07
May	7.3	7.0	22.50	23.74	6.05	7.23
Jun	7.0	6.9	23.12	25.14	7.10	8.04
Jun	6.8	7.0	22.40	23.64	6.57	7.46
Jul	7.2	7.2	25.64	25.32	7.00	7.00
Jul	6.8	7.1	25.64	26.09	8.31	7.52
Aug	6.7	6.8	25.02	25.14	9.28	8.60
Aug	6.5	7.0	25.99	25.26	10.07	7.66
Sep	6.7	6.9	25.36	25.99	8.85	8.04
Sep	6.9	6.7	25.55	26.27	8.07	9.20
Oct	6.6		25.57	25.44	10.06	9.50
Oct	6.6	6.7	25.14	25.74	9.71	9.04
Oct	6.4	6.6	24.94	25.00	11.86	10.50
Nov	6.8	6.9	24.27	25.49	8.15	8.97
Dec	6.9	6.7	24.94	26.22	9.42	8.61
$\bar{X}$	6.8	7.0	24.58	25.14	8.33	7.99

Table 13. Variation in mean epilimnetic total dissolved nitrogen (μg $N \cdot L^{-1}$) during 1985.

LAKE	GCL-2	Hobiton	Kennedy-1	Kennedy-2	Nimpkish-1	Nimpkish-2	Sproat-1	Sproat-2
Jan							400	400
Feb							507	604
Mar	266	224	275	300			654	432
Apr	210	219	158	199	415	297	192	228
Apr							289	300
May					257	163	193	162
May							135	156
Jun	144	178	169	172	262	271	134	221
Jun							252	170
Jul	465	816	645	513	148	148	652	783
Jul							155	132
Aug	151	164	141	186	196	184	201	173
Aug							142	161
Sep	111	105	115	112	214	233	122	144
Sep							360	253
Oct	96	163	167	180			120	144
Oct					239	128	206	175
Oct	160	146	125	138			168	154
Nov							197	148
Dec							450	359
$\bar{X}$	192	260	221	219	224	196	222	227

Table 14. Variation in mean epilimnetic nitrate (μg $N \cdot L^{-1}$) during 1985.

LAKE	GCL-2	Hobiton	Kennedy-1	Kennedy-2	Nimpkish-1	Nimpkish-2	Sproat-1	Sproat-2
Jan							27	24
Feb							34	36
Mar	35	30	49	28			43	30
Apr	35	25	45	27	52	54	23	13
Apr							21	7
May	28	14	34	25	38	41	12	2
May							8	<1
Jun	8	4	17	22	31	32	4	<1
Jun							2	<1
Jul	3	2	3	14	21	29	5	1
Jul							5	<1
Aug	1	1	<1	4	25	29	4	<1
Aug							2	2
Sep	1	1	1	3	20	22	3	<1
Sep							<1	<1
Oct	<1	2	2	1			<1	<1
Oct					33	27	<1	<1
Oct	3	7	20	17			2	3
Nov							6	4
Dec							24	18
$\bar{X}$	10	7	16	13	28	31	4	3

Table 15. Variation in mean epilimnetic ammonia (μg $N \cdot L^{-1}$) during 1985.

LAKE	GCL-2	Hobiton	Kennedy-1	Kennedy-2	Nimpkish-1	Nimpkish-2	Sproat-1	Sproat-2
Jan							7	8
Feb							8	6
Mar	<4	<4	<4	<4			<4	<4
Apr	5	5	6	<4			<4	<4
Apr							10	8
May	10	6	<4	6	<4	<4	6	7
May							<4	<4
Jun	<4	5	5	4		6	5	<4
Jun							<4	<4
Jul	7	<4	7	8	<4	<4	4	<4
Jul							<4	<4
Aug	<4	<4	<4	<4	<4	<4	<4	<4
Aug							<4	<4
Sep	<4	<4	<4	<4	7	6	<4	<4
Sep							<4	<4
Oct	<4	<4	<4	<4			<4	<4
Oct					<4	<4	<4	<4
Oct	<4	<4	<4	<4			<4	,4
Nov							<4	<4
Dec							<4	<4
$\bar{X}$	5	4	5	5	8	5	<4	<4

Table 16. Variation in mean epilimnetic total phosphorus (μg $P \cdot L^{-1}$) during 1985.

LAKE	GCL-2	Hobiton	Kennedy-1	Kennedy-2	Nimpkish-1	Nimpkish-2	Sproat-1	Sproat-2
Jan							1.3	1.1
Feb							1.3	1.2
Mar	<1.0	2.0	1.0	1.0			1.5	1.7
Apr	1.0	1.7	2.0	1.7	1.5	2.0	1.4	1.8
Apr							1.2	1.3
May	2.2	2.7	2.3	1.7	2.0	1.3	1.8	2.3
May							1.8	1.0
Jun	2.0	<1.0	1.0	2.0	1.3	<1.0	1.3	1.0
Jun							1.0	<1.0
Jul	1.3	2.0	2.3	3.0	2.3	1.5	1.5	2.0
Jul							1.2	<1.0
Aug	1.3	<1.0	<1.0	2.3	2.3	1.3	<1.0	<1.0
Aug							1.7	3.7
Sep	2.3	1.0	1.0	2.3	1.5	1.7	1.4	<1.0
Sep							3.3	1.3
Oct	2.7	1.3	1.3	2.0			2.3	1.0
Oct					2.0	1.7	<1.0	1.3
Oct	2.0	2.0	2.0	2.3			1.7	1.2
Nov							1.6	2.0
Dec							1.6	1.9
$\bar{X}$	1.8	1.6	1.6	2.2	1.9	1.4	1.6	1.5

Table 17. Variation in mean epilimnetic particulate phosphorus (μg $P \cdot L^{-1}$) during 1985.

LAKE	GCL-2	Hobiton	Kennedy-1	Kennedy-2	Nimpkish-1	Nimpkish-2	Sproat-1	Sproat-2
Jan							0.6	0.9
Feb							0.5	0.6
Mar	0.7	1.4	1.0	0.9			0.7	1.1
Apr	0.6	1.5	1.1	1.1			0.8	0.9
May	1.2	1.5	1.0	1.1	1.2	1.1	0.8	1.0
May							1.4	0.9
Jun	1.2	0.5	0.8	1.4	1.3	0.7	0.7	1.2
Jun							1.2	0.5
Jul	1.4	0.6	0.6	1.9	1.9		1.7	0.5
Jul							1.5	0.9
Aug	1.3	0.6	0.5	1.6	1.2	0.8	1.0	0.5
Aug							1.2	0.8
Sep	1.3	0.7	0.4	1.1	0.7	0.6	1.1	0.4
Sep							1.6	0.6
Oct	1.3	0.8	0.7	1.1			1.6	1.0
Oct					0.5	0.6	1.0	0.8
Oct	1.1	0.6	0.8	0.8			0.8	0.8
Nov							1.0	1.3
Dec							1.2	1.3
$\bar{X}$	1.2	0.9	0.7	1.3	1.2	0.8	1.2	0.8

Table 18. Variation in mean epilimnetic particulate carbon ($\mu g\ C \cdot L^{-1}$) during 1985.

LAKE	GCL-2	Hobiton	Kennedy-1	Kennedy-2	Nimpkish-1	Nimpkish-2	Sproat-1	Sproat-2
Jan							108	123
Feb							118	127
Mar	146	217	182	172			139	181
Apr	179	180	187	178	108	119	182	195
Apr							195	235
May	161	219	202	176	117	104	202	222
May							189	158
Jun	199	184	178	180	202	155	214	240
Jun							336	178
Jul	220	194	194	318	267	218	280	214
Jul							208	160
Aug	193	170	177	259	288	226	242	182
Aug							253	233
Sep	147	165	186	227	174	173	210	176
Sep							340	201
Oct	165	158	187	228			312	182
Oct					151	144	267	196
Oct	207	241	209	215			243	175
Nov							206	236
Dec							164	198
$\bar{X}$	182	185	188	225	201	171	254	198

Table 19. Variation in mean epilimnetic particulate nitrogen ($\mu g\ N \cdot L^{-1}$) during 1985.

LAKE	GCL-2	Hobiton	Kennedy-1	Kennedy-2	Nimpkish-1	Nimpkish-2	Sproat-1	Sproat-2
Jan							15	10
Feb							11	13
Mar	12	18	13	15			14	19
Apr	13	19	17	18	10	10	20	23
Apr							19	27
May	17	23	20	16	14	10	21	20
May							24	16
Jun	22	19	20	21	22	16	28	20
Jun							31	17
Jul	16	21	22	24	25	23	25	15
Jul							21	13
Aug	22	12	14	30	31	17	28	17
Aug							30	30
Sep	14	14	16	24	15	13	21	16
Sep							32	24
Oct	18	16	22	22			27	18
Oct					16	14	27	20
Oct	25	27	26	26			24	24
Nov							21	22
Dec							17	18
$\bar{X}$	18	18	19	22	20	15	26	20

Table 20. Variation in mean epilimnetic soluble reactive silicon (mg $Si \cdot L^{-1}$) during 1985.

LAKE	GCL-2	Hobiton	Kennedy-1	Kennedy-2	Nimpkish-1	Nimpkish-2	Sproat-1	Sproat-2
Jan							1.12	1.27
Feb							1.17	1.31
Mar	0.97	0.95	0.82	0.72			1.11	1.21
Apr	0.92	1.01	0.77	0.70	1.50	1.51	1.05	1.16
Apr							1.18	1.20
May	0.67	0.88	0.49	0.45	1.48	1.48	0.86	0.90
May							0.90	0.98
Jun	0.81	0.98	0.68	0.68	1.60	1.56	0.85	1.02
Jun							0.91	1.02
Jul	0.46	0.82	0.64	0.51	1.41	1.38	0.65	0.78
Jul							0.76	0.80
Aug	0.63	1.08	0.70	0.59	1.38	1.37	0.90	1.02
Aug							0.86	0.90
Sep	0.69	0.99	0.69	0.48	1.63	2.01	0.90	0.86
Sep							0.97	0.99
Oct	0.81	1.11	0.76	0.69			0.96	0.97
Oct					1.32	1.09	0.79	0.81
Oct	0.90	1.17	0.87	0.79			1.04	1.08
Nov							1.08	1.14
Dec							0.96	1.04
$\bar{X}$	0.72	0.99	0.68	0.59	1.48	1.52	0.87	0.96

Table 21. Variation in mean epilimnetic total dissolved solids ($mg \cdot L^{-1}$) during 1985.

LAKE	GCL-2	Hobiton	Kennedy-1	Kennedy-2	Nimpkish-1	Nimpkish-2	Sproat-1	Sproat-2
Jan							33.4	31.3
Feb							59.1	37.9
Mar	20.6	19.6	18.8	11.4			27.6	37.6
Apr	18.0	18.6	31.4	23.2	16.1	20.1	31.2	31.8
Apr							30.7	32.9
May	26.7	42.5	35.3	33.1	28.8	26.4	40.1	
May							37.7	34.9
Jul	23.9	21.9	29.3	21.3	31.6	22.0	36.2	33.1
Jul							34.8	34.7
Sep	22.7	22.5	27.2	24.1	22.0	22.7	34.1	35.3
Nov							37.7	36.1
$\bar{X}$	23.6	27.6	30.8	25.7	28.1	23.5	36.0	34.5

Table 22. Variation in mean epilimnetic bacterial numbers ($X10^6 \cdot mL^{-1}$) during 1985.

LAKE	GCL-2	Hobiton	Kennedy-1	Kennedy-2	Nimpkish-1	Nimpkish-2	Sproat-1	Sproat-2
Jan							0.71	0.68
Feb							0.67	0.77
Mar	0.77	1.28	0.99	0.53			0.73	0.79
Apr	0.74	0.84	0.91	1.44	0.68	0.37	0.41	0.35
Apr							0.55	
May	0.56	0.53	0.87	1.34	0.51	0.54	0.52	0.59
May							0.67	0.55
Jun	0.53	0.51	0.83	0.86	0.43	0.42	0.90	0.46
Jun							0.56	0.55
Jul	1.31	0.55	1.19	0.70	1.11	0.92	0.53	0.49
Jul							0.44	0.54
Aug	0.74	0.44	0.91	2.10	1.11	0.88	0.62	0.38
Aug							0.78	0.80
Sep	0.68	0.54	1.09	1.32	0.75	0.91	1.43	0.73
Sep							3.04	1.41
Oct	0.91	0.59	0.97	1.24	0.56	0.91	2.26	1.43
Oct							1.59	1.41
Oct	0.66	0.78	1.20	2.05			1.26	0.72
Nov							1.64	1.53
Dec							1.66	0.78
$\bar{X}$	0.77	0.57	0.97	1.31	0.76	0.74	1.12	0.72

Table 23. Variation in mean epilimnetic total chlorophyll ($\mu g \cdot L^{-1}$) during 1985.

LAKE	GCL-2	Hobiton	Kennedy-1	Kennedy-2	Nimpkish-1	Nimpkish-2	Sproat-1	Sproat-2
Jan							0.42	0.83
Feb							0.33	0.64
Mar	0.49	0.54	0.41	0.35			0.71	1.16
Apr	0.45	0.83	1.17	1.03	0.16	0.14	2.07	2.36
Apr							2.29	2.16
May	1.00	2.45	1.35	1.32	1.78	1.18	1.56	1.14
May							1.26	0.61
Jun	0.99	0.88	0.96	1.20	2.09	1.32	0.94	0.51
Jun							0.88	0.46
Jul	0.50	0.55	0.68	2.20	2.81	1.20	0.98	0.32
Jul							0.79	0.44
Aug	0.81	0.77	0.75	2.56	2.82	1.43	0.73	0.51
Aug							0.86	0.59
Sep	1.01	1.10	1.01	5.23	1.91	1.84	1.09	0.55
Sep							1.66	0.72
Oct	1.04	1.02	1.38	1.98			1.25	0.73
Oct					1.55	1.38	1.15	0.81
Oct	1.95	1.59	1.70	1.71			1.56	1.24
Nov							1.37	1.15
Dec							1.09	1.19
$\bar{X}$	0.90	1.13	1.06	2.24	2.15	1.36	1.11	0.89

Table 24. Variation in mean (1, 3 and 5 m) total algal volume ($mm^3 \cdot m^{-3}$) during 1985.

LAKE	GCL-2	Hobiton	Kennedy-1	Kennedy-2	Nimpkish-1	Nimpkish-2	Sproat-1	Sproat-2
Jan							1056	973
Feb							556	942
Mar	429	357	373	250			979	2195
Apr	609	498	1362	482	332	237	2129	3113
Apr							2878	6044
May	1660	1911	1631	652	434	406	3721	8540
May							4992	4259
Jun	4587	1393	904	803	2883	3080	4911	2783
Jun							4340	1712
Jul	9872	434	946	2096	981	114	2373	680
Jul							799	402
Aug							505	448
Aug	399	306	636	1101	1683	1279	644	404
Sep	380	415	1407	2985	1592	1303	465	414
Sep							601	486
Oct	702	331	944	774			703	429
Oct					1828	1590	332	1196
Oct	749	1200	893	496			624	339
Nov							749	390
Dec							390	678
$\bar{X}$	2534	800	1106	1269	1515	1427	1987	2300

Table 25. Variation in mean (1, 3 and 5 m) total algal carbon ($mg \cdot m^{-3}$) during 1985.

LAKE	GCL-2	Hobiton	Kennedy-1	Kennedy-2	Nimpkish-1	Nimpkish-2	Sproat-1	Sproat-2
Jan							103	101
Feb							54	81
Mar	39	46	38	34			88	208
Apr	57	61	139	64	38	30	191	256
Apr							254	444
May	140	179	140	70	53	51		595
May							365	299
Jun	315	105	87	92	208	219	352	205
Jun							321	129
Jul	617	60	90	206	89	104	212	69
Jul							122	55
Aug	62	52	76	130	133	98	102	80
Aug							72	66
Sep	62	56	123	252	132	107	72	68
Sep							110	78
Oct	96	51	103	102			109	70
Oct					122	107	54	104
Oct	83	103	85	72			85	49
Nov							85	44
Dec							52	76
$\bar{X}$	189	84	107	131	121	113	181	18

Table 26. Variation in mean euphotic zone primary production (>0.2 µm, 0.2-8.0 µm and >8.0 µm) (mg $C \cdot m^{-3} \cdot h^{-1}$) during 1985.

LAKE	>0.2 µm		0.2-8.0 µm		>8.0 µm	
	Sproat-1	Sproat-2	Sproat-1	Sproat-2	Sproat-1	Sproat-2
Jan	0.27	0.23	0.00	0.04	0.40	0.19
Feb	0.15	0.16	0.12	0.10	0.03	0.07
Mar	0.34	0.57	0.20	0.30	0.14	0.27
Apr	0.33	0.97	0.15	0.38	0.18	0.59
Apr	0.47	0.68	0.23	0.32	0.24	0.36
May	0.56	0.53	0.22	0.19	0.34	0.34
May	0.86	0.43	0.39	0.19	0.47	0.24
Jun	0.70	0.43	0.44	0.36	0.26	0.07
Jun	0.73	0.34	0.34	0.18	0.39	0.16
Jul	0.92	0.96	0.85	0.87	0.07	0.09
Jul	0.94	0.51	0.73	0.31	0.21	0.20
Aug	1.34	0.43	1.09	0.27	0.25	0.16
Aug	1.20	0.59	0.93	0.38	0.26	0.21
Sep	0.96	0.45	0.75	0.29	0.21	0.16
Sep	1.45	0.32	0.91	0.15	0.54	0.17
Oct	0.90	0.70	0.73	0.43	0.17	0.27
Oct	0.74	0.14	0.39	0.06	0.35	0.08
Oct	0.78	0.62	0.49	0.44	0.29	0.18
Nov	0.49	0.44	0.12	0.26	0.37	0.18
Dec	0.51	0.43	0.27	0.30	0.24	0.13
$\bar{X}$	0.94	0.54	0.64	0.31	0.29	0.22

Table 27. Variation in mean euphotic zone integrated hourly primary production (mg $C \cdot m^{-2} \cdot h^{-1}$), daily primary production (mg $C \cdot m^{-2} \cdot d^{-1}$) and primary production per unit of light (mg $C \cdot Einstein^{-1}$) during 1985.

	mg $C \cdot m^{-2} \cdot h^{-1}$		mg $C \cdot m^{-2} \cdot d^{-1}$		mg $C \cdot Einstein^{-1}$	
LAKE	Sproat-1	Sproat-2	Sproat-1	Sproat-2	Sproat-1	Sproat-2
Jan	4.45	4.42	19.42	25.24	7.68	8.04
Feb	2.99	3.51	19.82	53.60	2.45	6.89
Mar	5.75	9.26	38.68	64.22	1.61	2.72
Apr	6.54	13.62	51.02	104.21	2.93	8.01
Apr	8.84	13.00	85.76	91.72	3.37	3.70
May	9.49	8.28	94.56	64.92	4.54	2.96
May	14.46	6.71	129.90	151.53	5.35	3.86
Jun	13.41	9.43	195.54	87.86	7.41	3.24
Jun	13.78	7.57	136.44	130.66	2.16	2.59
Jul	18.93	22.52	252.65	317.38	4.65	5.41
Jul	20.41	9.62	170.56	118.43	2.85	1.96
Aug	29.96	11.06	223.23	151.50	4.87	7.58
Aug	25.22	12.70	213.58	154.95	4.51	3.02
Sep	22.07	10.90	169.94	102.85	13.45	6.09
Sep	23.58	8.19	274.86	145.03	10.34	4.42
Oct	20.50	14.69	249.59	266.53	12.06	9.41
Oct	15.78	3.66	137.77	57.38	9.80	11.43
Oct	11.75	13.40	66.30	96.71	7.34	23.94
Nov	6.61	11.49	33.31	62.79	4.24	14.01
Dec	9.86	8.70	63.53	68.98	14.50	21.22
$\bar{X}$	18.72	10.88	183.77	135.91	6.87	5.79

Table 28. Variation in volumetric zooplankton biomass (mg dry weight·m^{-3}) during 1985.

LAKE	GCL-2	Hobiton	Kennedy-1	Kennedy-2	Nimpkish-1	Nimpkish-2	Sproat-1	Sproat-2
Jan							3.8	1.1
Feb							1.9	3.1
Mar	2.9	2.5	2.4	1.2			1.6	2.9
Apr	3.7	2.3	3.2	4.2	1.4	0.5	2.7	3.6
Apr							2.4	2.1
May	1.8	3.0	4.9	1.8	0.8	0.9	1.5	2.5
May							2.9	4.2
Jun	6.0	6.2	2.8	5.2	5.9	3.1	4.6	3.3
Jun							6.0	6.0
Jul	33.1	8.0	4.6	10.3	8.9	5.2	9.9	7.2
Jul							7.4	6.9
Aug	11.0	3.3	6.0	5.0	3.7	5.0	20.3	17.4
Aug							29.2	12.8
Sep	10.3	2.3	3.8	5.1	7.1	7.1	26.1	7.3
Sep							12.5	27.0
Oct	8.6	1.8	3.0	3.9			14.5	19.4
Oct					6.9	7.1	9.0	15.8
Oct	5.3	2.2	2.7	10.9			8.6	27.7
Nov							7.2	9.5
Dec							10.4	6.4
$\bar{X}$	10.4	3.8	4.0	5.4	5.3	4.4	11.8	10.1

Table 29. Variation in zooplankton ash-free dry weight ($mg \cdot m^{-3}$) during 1985.

LAKE	GCL-2	Hobiton	Kennedy-1	Kennedy-2	Nimpkish-1	Nimpkish-2	Sproat-1	Sproat-2
Jan							3.3	1.0
Feb							1.5	2.4
Mar	1.9	2.3	2.3	1.2			1.4	2.5
Apr	3.1	1.8	2.0	3.2	1.3	0.6	2.4	3.2
Apr							2.2	2.2
May	1.3	2.6	4.6	1.8	0.7	0.8	1.5	2.0
May							2.4	2.2
Jun	4.4	6.0	2.8	5.0	5.5	2.9	4.1	3.2
Jun							4.9	5.8
Jul	12.2	7.6	4.3	9.2	8.1	4.5	8.3	6.1
Jul							6.7	6.4
Aug	6.5	2.7	5.6	4.4	2.3	4.0	19.0	16.1
Aug							28.0	11.8
Sep	7.8	2.0	3.6	4.9	4.7	5.6	24.8	6.9
Sep							11.8	25.8
Oct	8.2	2.2	2.9	3.9			14.2	18.5
Oct					4.0	4.9	8.4	15.4
Oct	3.2	2.0	2.5	10.6			8.2	27.0
Nov							7.0	9.0
Dec							7.4	6.1
$\bar{X}$	6.0	3.7	3.7	5.0	4.2	3.6	11.0	9.4

Table 30. Summary of mean epilimnetic data from Awun, Bonilla and Curtis lakes during the 1985 study.

LAKE	Awun		Bonilla		Curtis	
	Jun 18	Sep 10	Jun 18	Sep 11	Jun 18	Sep 11
TDS ($mg \cdot L^{-1}$)	68.8	30.4	16.0	26.7	21.5	18.4
TDN ($\mu g\ N \cdot L^{-1}$)	199	159	172	147	183	258
Nitrate ($\mu g\ N \cdot L^{-1}$)	15	17	2	3	2	1
Ammonia ($\mu g\ N \cdot L^{-1}$)	<4	5	5	6	<4	<4
TP ($\mu g\ P \cdot L^{-1}$)	2.0	5.3	<1.0	5.7	<1.0	5.3
SRS ($mg\ Si \cdot L^{-1}$)	1.66	1.83	0.37	0.35	0.30	0.37
Chlorophyll ($\mu g \cdot L^{-1}$)	2.20	2.08	2.66	2.73	3.27	4.36

Table 31. Summary of mean epilimnetic data from Devon, Eden, Ian and Kitlope lakes during the 1985 study.

LAKE	Devon	Eden		Ian-2	Kitlope	
	Sep 11	Jun 18	Sep 10	Jun 18	Jun 19	Sep 11
TDS ($mg \cdot L^{-1}$)	18.8	36.4	35.9	40.9	19.3	6.4
TDN ($\mu g\ N \cdot L^{-1}$)	198	222	224	241	178	220
Nitrate ($\mu g\ N \cdot L^{-1}$)	4	29	38	24	24	11
Ammonia ($\mu g\ N \cdot L^{-1}$)	5	7	7	5	5	<4
TP ($\mu g\ P \cdot L^{-1}$)	6.7	2.7	4.7	2.0	2.0	4.3
SRS ($mg\ Si \cdot L^{-1}$)	0.39	1.82	2.14	1.48	0.55	0.59
Chlorophyll ($\mu g.L-1$)	3.07	2.96	1.57	0.91	0.20	0.98

Table 32. Summary of mean epilimnetic data from Great Central (Stn. 1), Henderson, Muchalat and Skidegate lakes during the 1985 study.

LAKE	GCL-1	Henderson			Muchalat	Skidegate*
	Mar 12	Mar 12	Jun 11	Oct 1	Sep 17	Sep 11
Temperature (°C)	4.7	5.2	14.1			16.8
TDS ($mg \cdot L^{-1}$)	21.3	71.8			17.1	44.5
TDN ($\mu g\ N \cdot L^{-1}$)	489	134	185	134	365	202
Nitrate ($\mu g\ N \cdot L^{-1}$)	33	32	28	<1	4	4
Ammonia ($\mu g\ N \cdot L^{-1}$)	<4	<4	<4	<4	<4	<4
PN ($\mu g\ N \cdot L^{-1}$)	14	12	23		16	31
PC ($\mu g\ C \cdot L^{-1}$)	159	135	211		240	340
TP ($\mu g\ P \cdot L^{-1}$)	<1.0	1.0	2.0	2.3	<1.0	3.7
PP ($\mu g\ P \cdot L^{-1}$)	0.8	1.0	1.3		0.5	1.4
SRS ($mg\ Si \cdot L^{-1}$)	0.96	1.07	0.53	0.31	1.45	1.51
Bacteria ($X10^6 \cdot mL^{-1}$)					0.46	1.19
Chlorophyll ($\mu g \cdot L^{-1}$)	0.57	0.40	1.90	6.87	1.35	2.31
Alg. Volume ($mm^3 \cdot m^{-3}$)	369	386				
Alg. Carbon ($mg\ C \cdot m^{-3}$)	36	32				

*Skidegate Lake
Secchi depth (m) - 3.0
Compensation depth (m) - 4.5
Extinction coefficient (k_e) - 0.94

Table 33. Summary of mean epilimnetic data from Long, Morice and Yakoun lakes during the 1985 study.

LAKE	Long-1	Long-2	Morice-1		Morice-2		Yakoun	
	Aug 19	Aug 19	Jun 19	Sep 11	Jun 19	Sep 11	Jun 18	Sep 10
TDS ($mg \cdot L^{-1}$)			20.1	26.9	26.0	30.9	13.2	30.4
TDN ($\mu g\ N \cdot L^{-1}$)	129	156	177	152	197	190	180	160
Nitrate ($\mu g\ N \cdot L^{-1}$)	2	<1	32	17	37	18	7	2
Ammonia ($\mu g\ N \cdot L^{-1}$)	<4	<4	<4	6	<4	<4	4	<4
TP ($\mu g\ P \cdot L^{-1}$)	4.0	3.3	<1.0	2.7	<1.0	2.0	2.0	4.0
SRS ($mg\ Si \cdot L^{-1}$)	0.42	0.43	1.17	1.16	1.17	1.20	0.88	0.86
Chlorophyll ($\mu g \cdot L^{-1}$)	2.37	2.41	0.66	0.86	0.52	0.89	1.55	3.69

Table 34. Results of the 1985 Tahltan Lake study.

Sampling date	June 18	July 16	August 13	September 10
Surface temperature (°C)	7.5	13.1	14.3	12.0
Mean epilimnetic temperature (°C)	7.4			11.8
Depth of maximum stability (m)	19.3			17.6
Modified Schmidt stability index ($kg \cdot s^{-2}$)	204			1137
Secchi depth (m)	7.0	12.5	12.0	8.5
Compensation depth (m)	14.5	17.2	17.4	20.3
Mean extinction coefficient (k_e)	0.30	0.26	0.25	0.21
Mean epilimnetic TDS ($mg \cdot L^{-1}$)	124.9		173.2	122.8
Mean epilimnetic PC ($\mu g\ C \cdot L^{-1}$)	350	298	257	342
Mean epilimnetic PN ($\mu g\ N \cdot L^{-1}$)	42	35	29	37
Mean epilimnetic TDN ($\mu g\ N \cdot L^{-1}$)	302	195	214	200
Mean epilimnetic NO3 ($\mu g\ N \cdot L^{-1}$)	<1	<1	<1	2
Mean epilimnetic NH4 ($\mu g\ N \cdot L^{-1}$)	<4	<4	<4	<4
Mean epilimnetic TP ($\mu g\ P \cdot L^{-1}$)	5.1	5.0	5.0	4.1
Mean epilimnetic PP ($\mu g\ P \cdot L^{-1}$)	4.1	3.0	2.0	2.7
Mean epilimnetic SRS (μg Si·L-1)	2.44	2.39	2.42	2.42
Mean epilimnetic bacteria ($X10^{6} \cdot mL^{-1}$)				
Mean epilimnetic T. Chl. ($\mu g \cdot L^{-1}$)	1.26	0.89	0.91	1.97
Zooplankton biomass (mg dry $wt \cdot m^{-3}$)	59.3	90.2	57.2	154.9
Zooplankton AFDW ($mg \cdot m^{-3}$)	56.0	85.7	51.1	142.7

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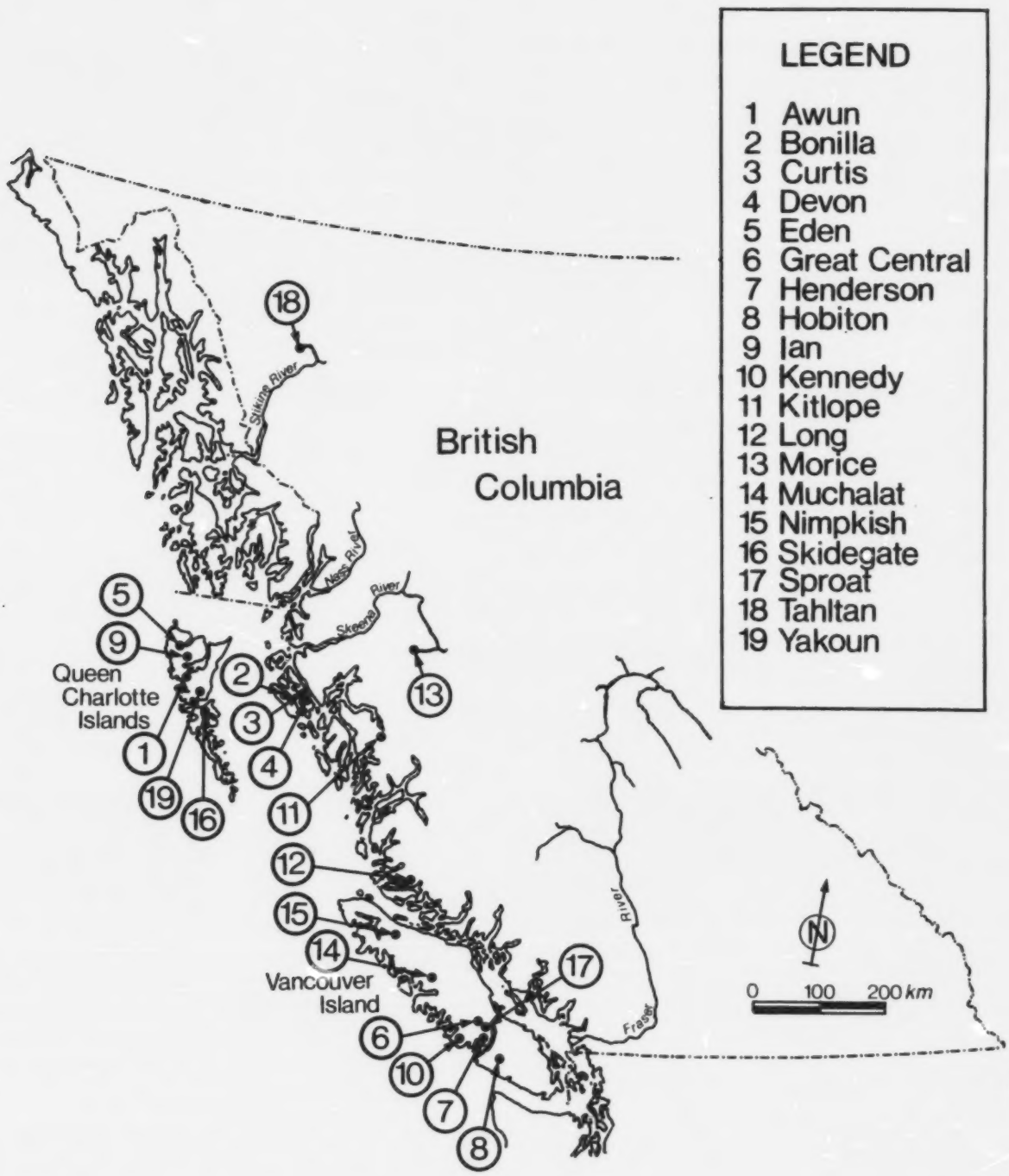

Fig. 1. Location of lakes studied in the 1985 program.

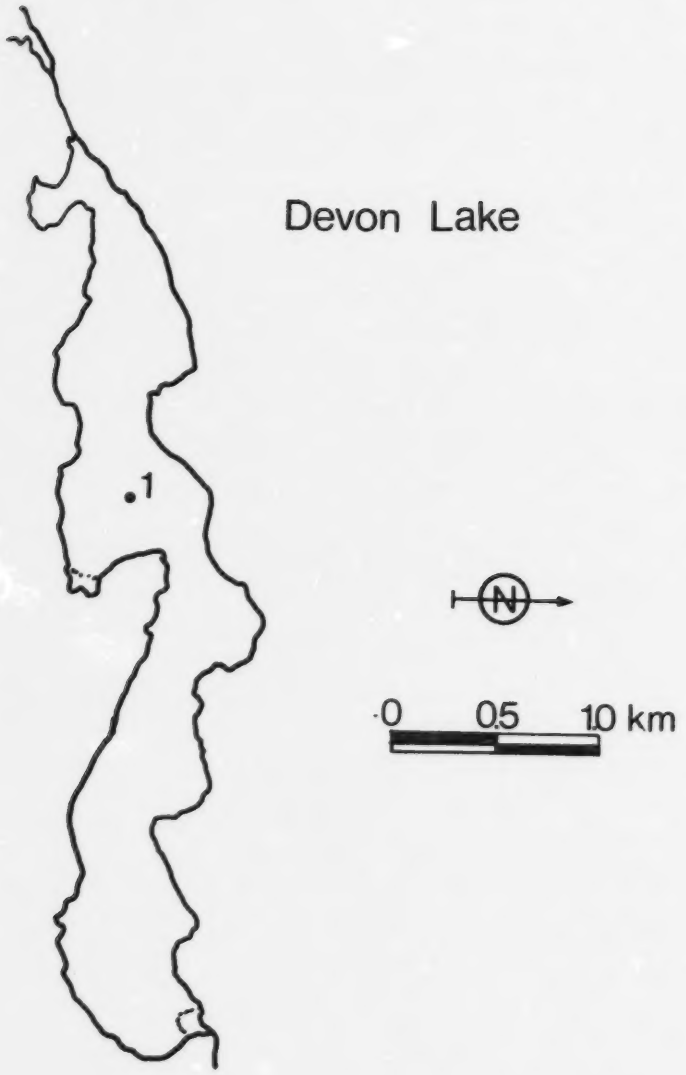

Fig. 2. Location of sampling station at Devon Lake.

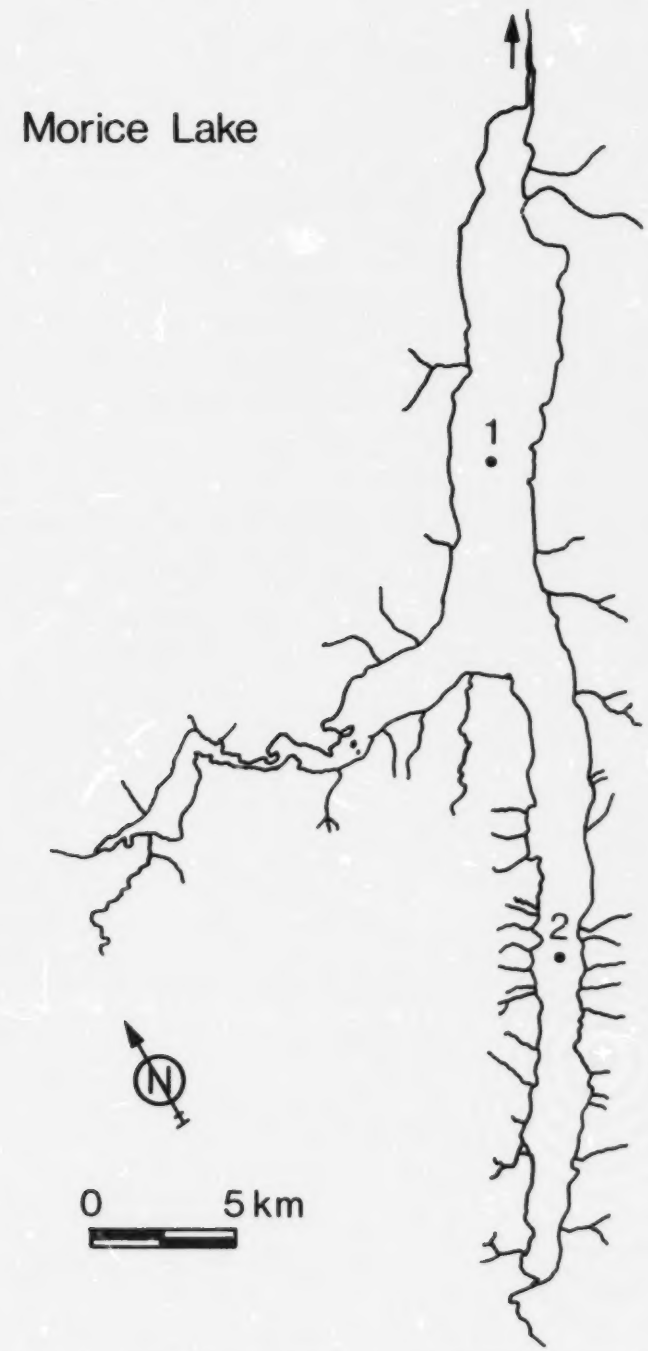

Fig. 3. Location of sampling stations at Morice Lake.

Fig. 4. Location of sampling station at Muchalat Lake.

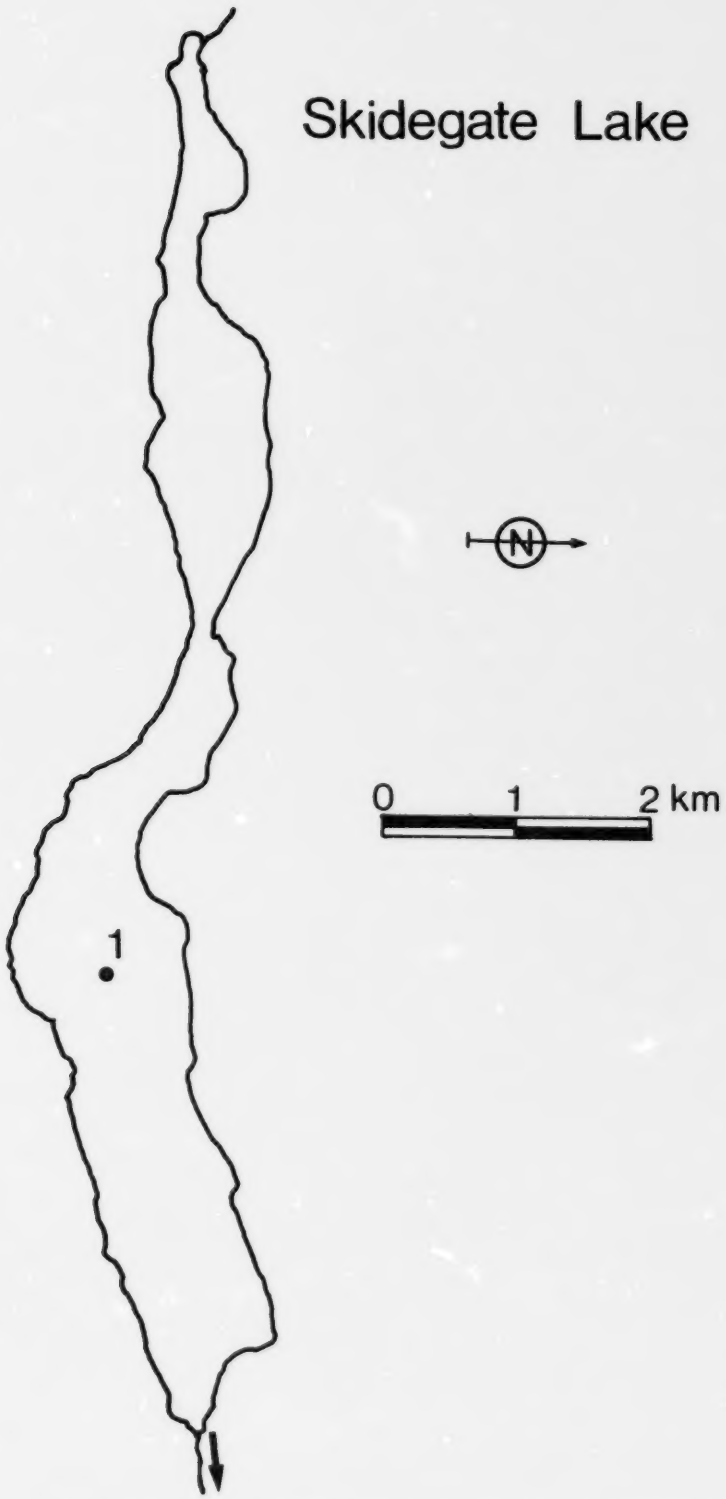

Fig. 5. Location of sampling station at Skidegate Lake.

Fig. 6. Location of sampling station at Tahltan Lake.

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Appendix table 1 through Appendix 122 do not appear in paper, but appear in microfiche form at the back of this report.